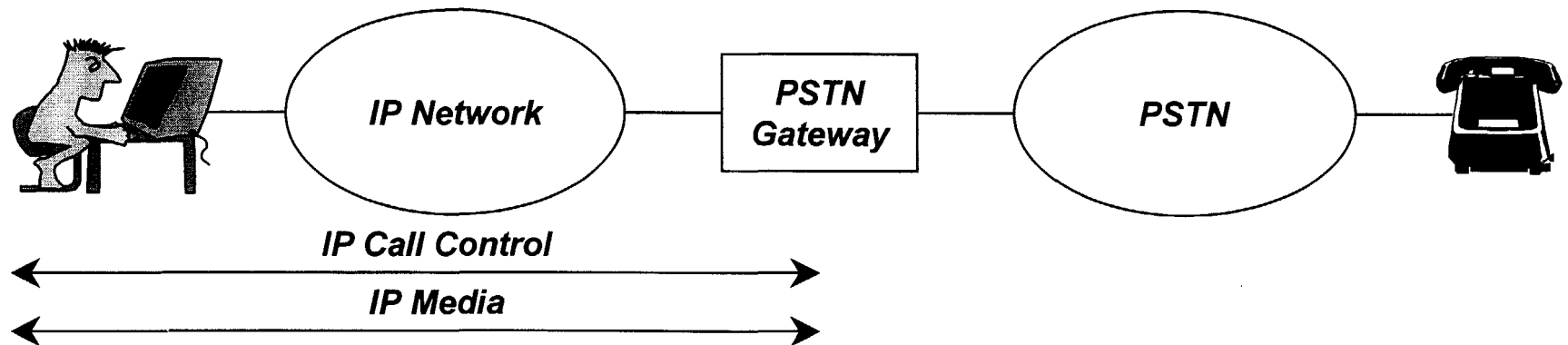
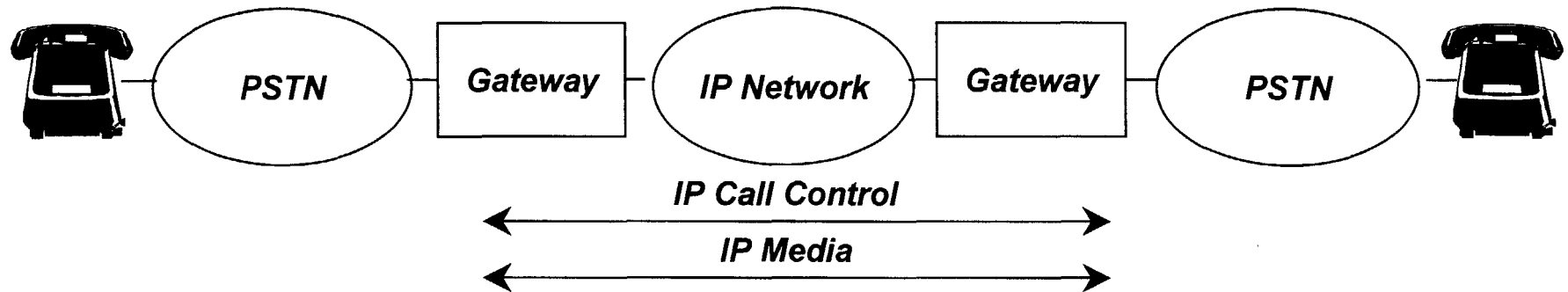


IP Telephony 1998: PC-Phone



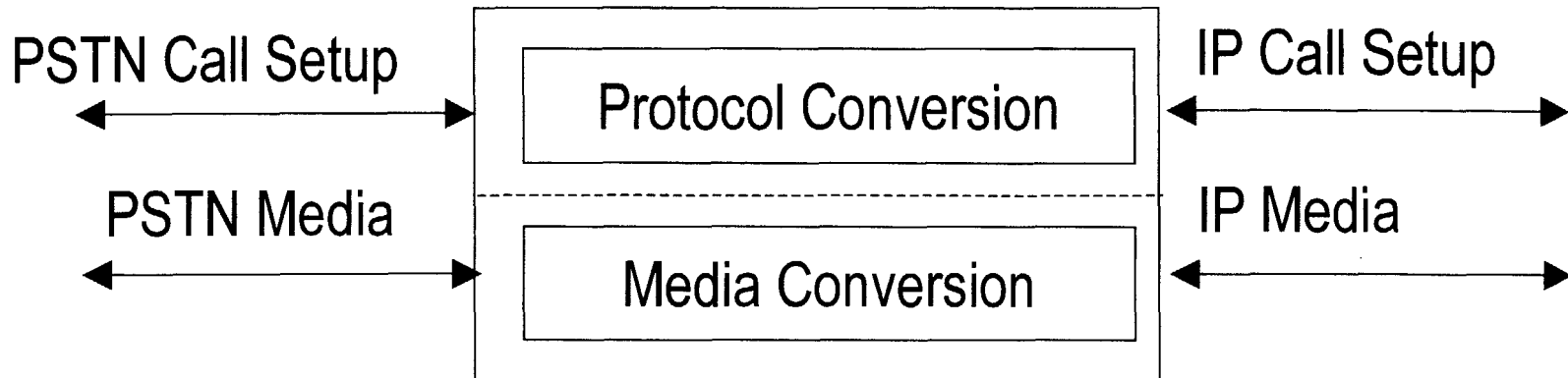
- Allows PCs to connect to any telephone
- Simple extension of PC-PC case
 - Only minor changes to PC software
- Protocols terminated at the gateway
- Two-stage dialing in both directions
 - PC may need a phone number

IP Telephony 1999: Phone-Phone



- A natural extension of the PC-Phone case
- Gateways are generally outside the PSTN
 - Like ISP modem pools
 - Some tighter integration now required to avoid two-stage dialing
- Gateway-gateway interoperability is critical
- Today's IP telephony networks work this way

What do IP Telephony Gateways do?



- Call control protocols are translated between PSTN and IP forms
- Circuit-switched streams of digital information representing voice are converted to packets of data representing compressed voice

Low Bit-rate Codecs

- ITU-T G.723.1 and G.729A are most commonly used on IP networks
 - Early products used non-standard codecs
- 5,300 bit/s (G.723.1) to 8,000 bit/s (G.729A)
 - Possible to carry over dial-up modem lines
 - Many more conversations can be carried on the same circuit
- Model human vocal tract
 - Very poor at reproducing audio that can't be spoken by humans
 - Distort any dual-tone or modulated data signals

Other Impairments

- Delay introduced at many points in the path
 - PC audio device drivers and operating system
 - Buffering in transmitter and receiver
 - Receiver buffering required to handle jitter (delay variation)
 - Coding and decoding delay
 - Routers
- Packet loss caused by network congestion
 - Causes signals to break up
 - Can result in multiple tones (DTMF) or characters
 - Receiver can mask this effect to some extent
- Can be ameliorated by QOS measures
 - Being deployed by some networks now

Text Telephones

- Small, portable, battery-powered LCD terminals
- Use various modulation schemes depending on country or region
 - All described in ITU-T Recommendation V.18
 - FSK, V.21, V.23, Bell 103, DTMF
 - In North America, most TTs use 5-bit Baudot character set similar to teletypes, on a 45.5-baud FSK modulation which turns on and off for each key
- None are carried well by low-bitrate codecs due to human speech modeling

Why not move to Internet Chat?

- Standards already in place and widely used
- Avoids long distance charges
 - All calls to local ISP
- Point-to-point capabilities with instant messaging
 - Be informed when your friends come online
- Multiparty chat capability
- Friends with computers don't need TTs
- Lots of other things you can do with a PC!
- Isn't *everybody* on the Internet anyway?

Advantages of Text Telephones

- Compact, lightweight, rugged
 - No hard disk or fragile parts
 - Very long battery life
- Much less complex than computers
 - No setup, no blue screens, no reboots!
 - Easy to connect anywhere (acoustic or modular)
- Don't need a rendezvous server (ILS, ICQ, etc.)
 - Just a point-to-point phone call
 - No modem training time; instant connections
 - Travels well – no local ISP access numbers to find

Cost of Text Telephone Use

- Much less expensive than PCs (~\$200)
 - Many TTs provided free to users by charity or agency
- No recurring ISP access charges
 - Local TT calls are “free” (just cost of phone line)
 - No credit card needed to set up an account
- Existing relay services funded by TRS surcharge on local phone bills
 - Funding model won't easily support wholesale upgrades

Users of Text Telephones

- Many TT users are not computer-literate
 - Disabilities can make training harder
- Some hearing impaired users switch between voice and TT, particularly when using a relay service
 - Can't when using a modem that requires handshaking
- ADA mandates TT access for governments and enterprises
 - Not easy to make changes to laws
- Installed base is huge!
 - People don't like to change if they don't see substantial benefits

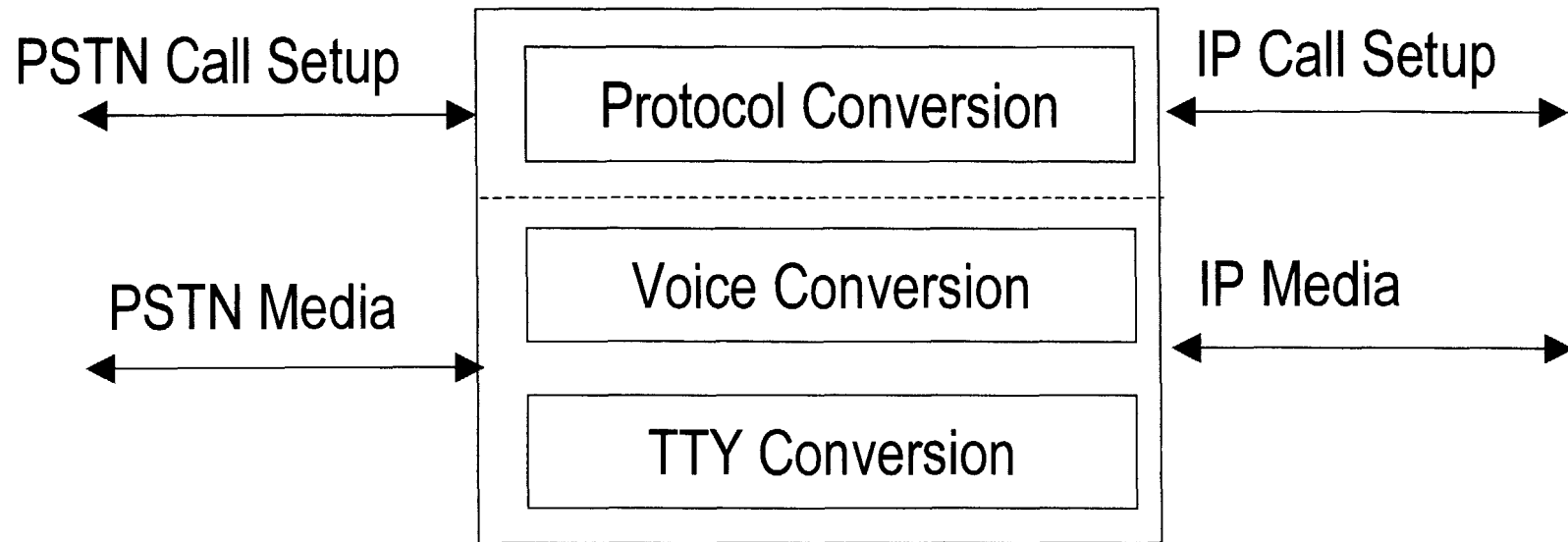
How to Move Forward?

- Chat appliances are coming
 - May be built into telephones
 - Lower cost and complexity
 - But most roadblocks would still exist
- Ubiquitous broadband access will reduce need for low bit-rate codecs
 - But not nearly soon enough
- IP telephony networks and equipment *must* support existing text telephone traffic

Potential Solutions

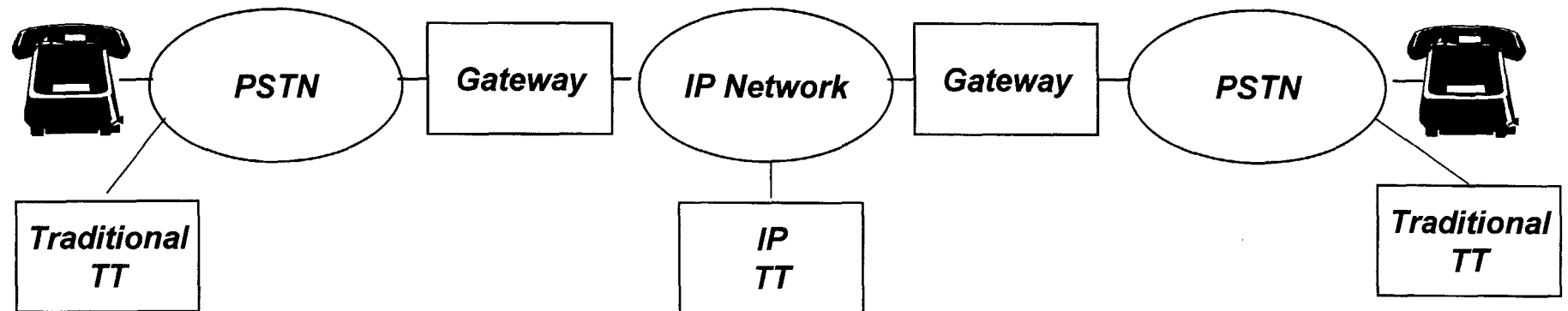
- Use higher bit-rate codecs
 - G.711 is not economically feasible with current business models
 - Delay, jitter, and packet loss issues would remain
 - G.722.1 could provide “better than toll quality” and also support TTs
- Take text telephone data “out of band”
 - Demodulate at originating gateway, remodulate at destination
 - Well-known technology
 - Already used for DTMF and fax on IP gateways
 - Also used for fax and data modem traffic on international circuits in the PSTN (DCME/PCME)

How Can Gateways Support TTs?



- Gateway must detect TT signals and convert them to packetized data form instead of digitized audio
 - Uses even less bandwidth and is more efficient
- Call control protocols must also be enhanced to indicate the use of TTs

New and Old TTs Can Interwork



- IP Telephony gateways need TT enhancements
- New IP based TTs or TTs integrated with standalong or PC-based videophones become possible
- “Chat servers” can support multiparty TT calls

Steady Progress

- Standards to be adopted in February
 - Gunnar Hellström will provide an update
- Technology is being developed
 - Gunnar Hellström will provide a demo, too!
- Industry is committed to deployment
 - It's the right thing to do!
 - The benefits of next-generation networks will be available to all users

Thank you!

Questions?

ATTACHMENT B

**TEXT TELEPHONY AND TOTAL CONVERSATION
IN THE IP REVOLUTION**

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Q9 Accessibility to Multimedia

Text Telephony and Total Conversation in the IP revolution

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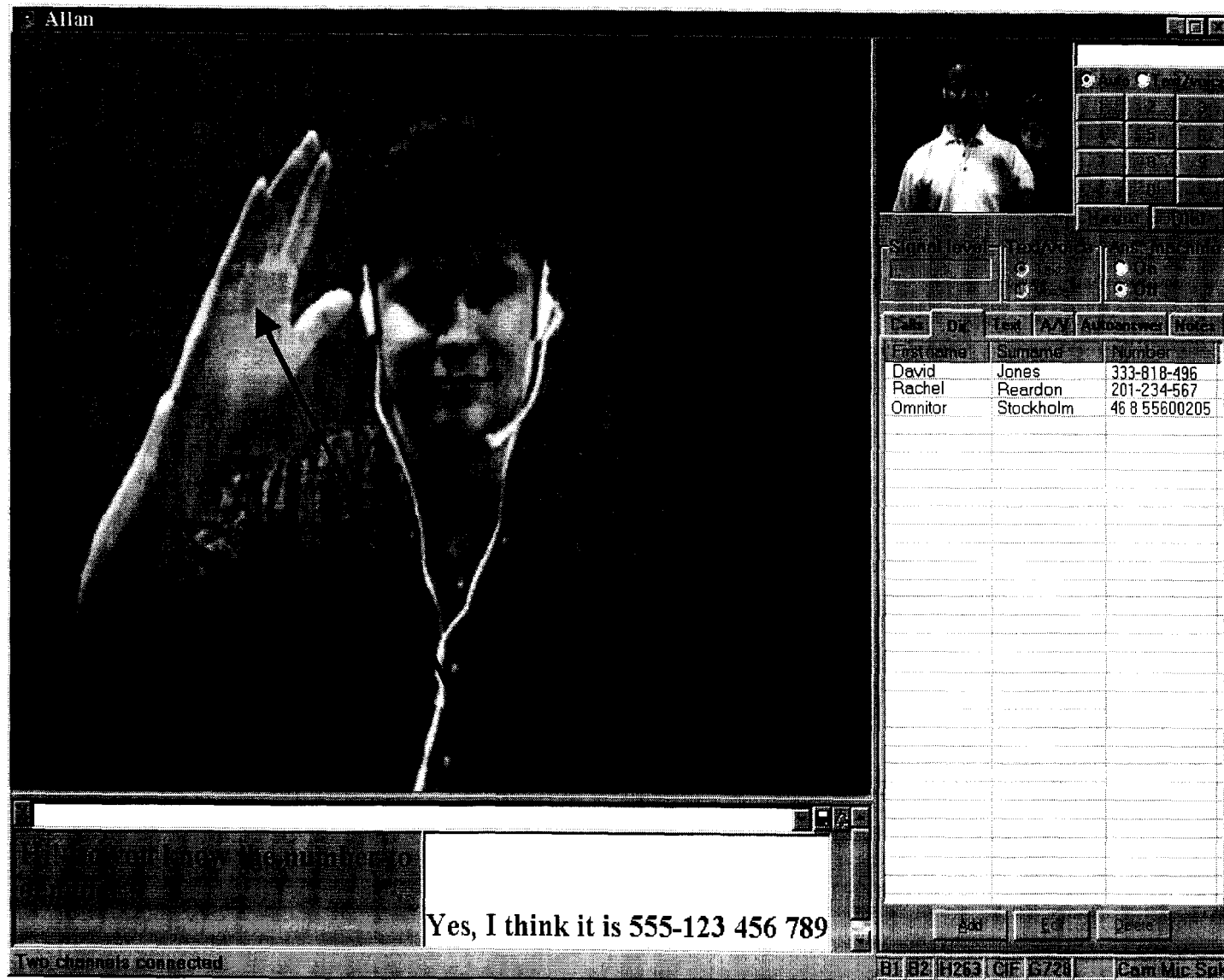
Accessibility opportunities in IP networks

- IP networks take over telecomm traffic
- Opportunity:
 - Combine text, video and voice
 - Interworking between many ways to access the network
 - Next generation mobile will have IP capabilities
- Important points to consider
 - Interworking with Textphones in the Telephone Network is desired.
 - IP Transit for textphones requires special consideration
 - A simple IP textphone is needed

Total Conversation standards

- Text conversation need standards as well as video and audio.
- Work is close to completion in ITU-T and IETF to define extension of video telephony to Total Conversation with video, text and voice
- Subsets are possible for text telephony

Example of a Total Conversation Terminal



Opportunities with Total Conversation

- Deaf: sign, type or lip-read as the situation calls for.
- Adult deaf: speak and see and get text back.
- Hearing impaired – Hear and lip-read as far as possible, revert to text when needed.
- Video relay services: Transfer phone number to call
- Speech impaired: Hear and type. Or hear and speak and revert to typing when needed.
- Anyone: Communicate in preferred mode, type when needed for names, phone numbers etc.

Opportunities with local additions to Total Conversation

- Screen reader and Braille display makes text conversation accessible to deaf-blind users.
- Voice recognition can make voice conversation convenient with adult deaf users.

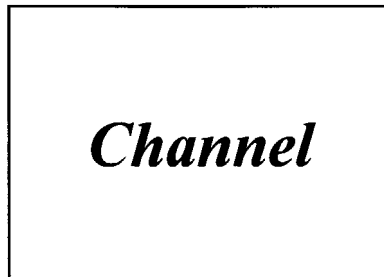
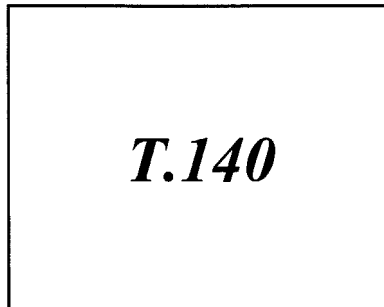
T.140, the common base for text conversation

- Standardised in ITU-T 1998
- Extremely simple end-to-end text chat protocol
- User input to Unicode UTF-8 coded transmission
- UTF-8 transmission to display
- Safe and easy to include everywhere

What is the street address?	Alameda 34
------------------------------------	-------------------

T.140 text protocol

User application



Network

- Character by character transmission
- Character code for any language: ISO 10646 (= Unicode).
- Control from ISO 6429:
 - Erase last character,
 - New line,
 - Select graphic rendition
 - Alert in session
- Transport channel must be specified for each environment.